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Child Physical and Sexual Abuse and Cigarette Smoking in Adolescence and Adulthood

Allison N. Kristman-Valente, MSW, **Eric C. Brown, PhD**, and **Todd I. Herrenkohl, PhD**
Social Development Research Group, School of Social Work, University of Washington

Abstract

Purpose—Analyses used data from an extended longitudinal study to examine the relationship between childhood physical and sexual abuse (CPA and CSA, respectively) and adolescent and adult smoking behavior. Two questions guided the study: (1) Is there an association between childhood abuse and adolescent and adult smoking behavior? (2) Does the relationship between childhood abuse and later cigarette smoking differ for males and females?

Methods—A censored-inflated path model was used to assess the impact of child abuse on adolescent and adult lifetime smoking prevalence and smoking frequency. Gender differences in significant model paths were assessed using a multiple-group approach.

Results—Results show no significant relation between CPA or CSA and risk of having ever smoked cigarettes in adolescence or adulthood. However, for males, both CPA and CSA had direct effects on adolescent smoking frequency. For females, only CSA predicted increased smoking frequency in adolescence. Adolescent smoking frequency predicted adult smoking frequency more strongly for females compared to males.

Conclusions—CPA and CSA are risk factors for higher frequency of smoking in adolescence. Higher frequency of cigarette smoking in adolescence increases the risk of higher smoking frequency in adulthood. Results underscore the need for both primary and secondary prevention and intervention efforts to reduce the likelihood of childhood abuse and to lessen risk for cigarette smoking among those who have been abused.

Keywords

substance use; smoking; cigarettes; trauma; child abuse; sexual abuse; physical abuse

Introduction

Smoking is a serious public health concern [1]. Tobacco use increases the risk of major health impairments and is the leading cause of morbidity and mortality in the United States [2, 3]. The use of tobacco products often begins in adolescence and peaks in prevalence during young adulthood. However, unlike other commonly used drugs, such as marijuana, which lessen in prevalence after late adolescence and early adulthood, tobacco use remains

Correspondence regarding this article should be addressed to Allison Kristman-Valente, School of Social Work, University of Washington, 4101 15th Ave NE, Box 354900, Seattle, WA 98105. 206-543-5640 (Phone); 206-543-1228 (Fax); ankv@uw.edu.

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prevalent throughout adulthood [4, 5]. In the latest results from the 2011 National Survey of Drug Use and Health, 22.1% of persons age 12 and older were found to be current smokers. Among adults 35–39 years of age, the rate was closer to 25%. Evidence suggests that males are more likely than females to smoke [6]. However, smoking is equally prevalent among adolescents of both genders in the age range of 12–17 years [6]. Despite a significant decline in smoking among adults and adolescents nationwide many individuals in the United States continue to smoke with regularity.

One of the most effective ways of reducing smoking prevalence is to prevent young people from using cigarettes and other tobacco products [7, 8]. To do so requires that programs focus on the prevention of smoking onset by addressing various risk factors for the behavior. Childhood physical (CPA) and sexual (CSA) abuse are risk factors for smoking and other health-damaging behaviors. In a study by Hapke and colleagues [9], participants with trauma histories related to abuse were at higher risk for smoking and for developing an addiction to nicotine. In that study, the odds of lifetime smoking for abuse victims were nearly three times greater than those without abuse histories (OR = 2.91). Those who were abused were also at a higher risk of current smoking (OR = 2.34) and nicotine dependence (OR = 3.82). Other studies have shown that CPA increases the risk of smoking during adolescence [10, 9, 16] and adulthood [11–13].

These findings are informative, yet it is important to disentangle the impacts of differing forms of abuse on later smoking to establish if one form is potentially more problematic than another. Of primary interest in the current investigation is whether CPA and CSA uniquely and comparatively predict measures of lifetime and frequent smoking during adolescence and adulthood. Also of interest is the extent to which patterns of abuse to later smoking differ for males and females. Analyses are guided by two questions: (1) Is there an association between childhood abuse and adolescent and adult smoking behavior? (2) Does the relationship between childhood abuse and later cigarette smoking differ for males and females?

Review of the Literature

Several cross-sectional studies have investigated the relation between childhood adversities and smoking behavior later in life. For example, Felitti and colleagues [14] found a relationship between the number of retrospectively-reported adverse childhood events and current smoking behavior among adults. Additionally, Anda et al. [11] found that these same childhood adversities were associated with an individual's having initiated smoking before age 14 and their smoking heavily in adulthood.

Notably, there have been few longitudinal investigations of childhood abuse and later smoking to help corroborate findings of these cross-sectional studies [10, 12, 13]. One exception is Mersky and Topitzes [12] analysis of data from the Chicago Longitudinal Study. They found that officially recorded child maltreatment (neglect, physical and sexual abuse) before age 18 predicted daily tobacco use among young adults. In another study of the same dataset, Topitzes and colleagues [13] found that officially recorded child maltreatment predicted daily smoking at ages 22 to 24. The effect of child maltreatment on later smoking was mediated by several variables, including adolescent delinquency.

In another study, Lewis and colleagues [10] investigated the relationship between child welfare involvement (a proxy measure of child maltreatment) and adolescent smoking, using data from the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) project. They found that youth involved with child welfare before age 12 were more likely than those not involved with welfare to smoke at age 16. Interestingly, the effect of child welfare involvement on later smoking was partially mediated by internalizing problems at age 14.

Finally, there has been little attention given to the possibility of gender differences in pathways from abuse to later smoking, although research on abuse and substance use of a more general form has shown gender differences are possible [15, 16]. The earlier mentioned study by Topitzes et al. [13] did compare males and females but found no difference by gender. Given the paucity of investigations, more research is necessary.

Methods and Materials

Study design

The Lehigh Longitudinal Study began in the 1970s as a project focused on the correlates and consequences of childhood maltreatment [17, 18]. Further information on the sample and study procedures can be found in earlier publications. Herrenkohl et al. [17] provide information on the original study design and more recent data collection efforts involving the longitudinal panel. Further details of the study can be found in published sources and are available upon request from the corresponding author.

Recruitment

Participants were recruited from child welfare abuse and protective service programs, Head Start classrooms, daycare programs, and private nursery programs in a 2-county area on the East Coast of the United States. The original sample consisted of 457 children and their families. At the time of the first assessment in 1976–1977, children in the study were 18 months to 6 years of age. Subsequent assessments were completed during 1980 to 1982 when children were in elementary school; 1990–1992 when participants entered adolescence; and most recently in adulthood (2008 to 2010), when participants were on average 36 years of age.

Procedures

Data for the current analyses were collected at all 4 waves of the longitudinal study. Data were from surveys administered to parents of the child participants during the first 2 waves of the study and from child participants, now adults, themselves during the adolescent and adult data collection waves.

Participants

The ethnic and racial backgrounds of the original 457 child participants are consistent with the makeup of the 2-county area from which the sample was drawn: 1.3% (n = 6) American Indian/Alaska Native, 0.2% (n = 1) Native Hawaiian or Other Pacific Islander, 5.3% (n = 24) Black or African American, 80.7% (n = 369) White, 11.2% (n = 51) more than one race, and 1.3% (n = 6) unknown. Just over 7% (n = 33) self-identified as Hispanic or Latino, and 91.5% (n = 418) self-identified as Not Hispanic or Latino. Eighty-six percent of children were from 2-parent households. The income level of 63% of families at the time was below $700 per month. Other families had incomes that ranged to over $3,000 per month. Analyses of the current study include 357 (78%) of the original 457 child participants who were recently re-assessed in adulthood. The adult sample remains gender balanced, with 186 males and 171 females. Study procedures were approved by the Human Subjects Division at the University of Washington and the Office of Research and Office of Sponsored Programs at Lehigh University.

Measures

Physical abuse, also called harsh physical discipline in other published reports from the Lehigh Longitudinal Study (e.g., Herrenkohl et al. [19]), is a standardized composite measure of mothers' self-reported abusive disciplining of children assessed during the

preschool and school-age waves of the study. In these early assessments, parents were asked about a range of disciplining practices, including those of an abusive nature, such as *biting child so as to bruise*, *slapping child's face*, *or hitting child with stick or other hard object*. In the preschool wave of the study, mothers, and some fathers, were asked about the frequency with which they disciplined their children *prior to the last 3 months* and *during last 3 months*. In the school-age assessment, the practices were assessed for the past year. Each practice was rated for severity by a group of 24 child welfare workers and child development specialists and then assigned a severity weight, which ranged from 1 to 3 [20]. These scores were averaged, standardized, and then combined. Higher scores on the index reflect more severe (abusive) practices across the three periods. Scale scores for the analysis sample ranged from −4.10 to 7.26 (M = .09, SD = 2.26).

Sexual abuse is assessed with a single item from the adolescent wave of the study in which participants reported whether they had been sexually abused or raped before the age of 18 (0 = no reported sexual abuse, 1 = affirmative sexual abuse). Approximately, 24% of participants in the analysis sample reported having been sexually abused. More females than males were found to have been sexually abused (33% vs. 17%, respectively).

Smoking behavior in adolescence consist of self-reports from a single assessment point in adolescence of how many cigarettes had been smoked during the prior year. Just over 50% of the sample smoked cigarettes, according to the measure. Males were significantly more likely than females to report having smoked in adolescence (57% vs. 44%, respectively). Among those who smoked, the frequency of their smoking ranged from 1 cigarette to 560 cigarettes per week.

Smoking in adulthood combined lifetime and past-year self-reports from a single assessment point in adulthood of ever having smoked and, if they had smoked, frequency of smoking in the past year. Measures of smoking in adulthood (average age 36) showed that 49% of the sample had smoked in the past year. Adult males and females did not differ in their rates of smoking in the past year (50% vs. 49%, respectively). Among those who smoked, the frequency of their smoking ranged from 1 cigarette to 350 cigarettes per week.

Covariates

Prior studies show that low socioeconomic status is a consistent risk factor for smoking [21]. Thus, we included childhood socioeconomic status (SES) as a covariate in the model. This measure is a standardized composite measure of parents' occupational status, educational level, family income, and total rooms in the family's home. The SES variable has M = 0 and SD = 3.29 for the analysis sample. Gender (males=1; females=2) also is included as a model covariate in the censored model test using the full sample described below. In analyses that examined gender as a moderator of abuse on later smoking, gender was removed as a covariate.

Analytic method

Analyses were conducted in Mplus Version 6.0 [22]. Two separate analyses were conducted to best address the guiding research questions: (1) Is there an association between childhood abuse and adolescent and adult smoking behavior? (2) Does the relationship between childhood abuse and later cigarette smoking differ for males and females? To answer the first question, we used a censored-inflated modeling technique to investigate, for the full analysis sample, whether there is an association between childhood abuse and adolescent and adult cigarette smoking. Censored-inflated modeling simultaneously conducts a regression model that decomposes the distribution of the dependent smoking variables into a normative frequency-of-smoking part that models the continuous part of the distribution,

and an inflated "nonsmoker" part that models the preponderance of nonsmoking behavior over and above the normative distribution [22, Chapter 3]. Indirect effects of childhood abuses on adult smoking through adolescent smoking were investigated using procedures recommended by Shrout and Bolger [23]. The second question regarding gender moderation required a multi-group analysis procedure described in Vandenberg and Lance's [24] earlier published article. The steps of the analysis consisted of (1) freely estimating the relation between CPA and CSA and cigarette smoking for males and females; (2) constraining all paths of the model to equality to determine if the imposed constraints reduced the overall fit of the model; (3) if indicated each path of the model (e.g. CPA to adolescent smoking frequency) was tested for invariance. Fit was assessed using the Likelihood Ratio Test (LRT), which approximates a change in chi-square of the unconstrained and constrained models. A significant change in the likelihood ratio indicates that the relation between childhood abuse and smoking differ for males and females. The LRT, as a measure of discrepancy of model fit, shows not only if the model for males and females differed overall, but also where in the model differences might exist. To attend to missing values, multiple imputation procedures were used, following recommendations of Graham [25], and using Rubin's [26] rules to average results across imputations. Twenty imputed data sets were used in analyses of direct and indirect effects following the recommendations of Graham et al. [27].

Results

Descriptive statistics

Table 1 provides zero-order correlations for all variables in the analysis. In the full sample, CPA is correlated moderately with lifetime smoking prevalence ($r = .18$) and frequency ($r = .19$) of past-year smoking in adolescence, but is not correlated significantly with lifetime smoking prevalence or past-year frequency of smoking in adulthood. CSA is correlated with past-year smoking during adolescence ($r = .16$ and .26, respectively) and with an individual's having ever smoked as an adult ($r = .25$). Both forms of abuse are correlated moderately and negatively with childhood socioeconomic status, albeit childhood sexual abuse somewhat more strongly ($r = -.36$). Female gender is correlated positively with CSA ($r = .23$) but not CPA. Also of note in Table 1, past-year smoking in adolescence is not related to lifetime smoking prevalence in adulthood, although the frequency of smoking in adolescence is related strongly to the frequency of smoking in adulthood ($r = .41$).

Question 1: Is there an association between childhood abuse and adolescent and adult smoking behavior?

Figure 1 shows the significant paths of a censored main effects model for the full sample. Smoking behavior during adolescence and adulthood is depicted as two distinct components (prevalence and frequency of smoking) represented by adjacent boxes for the adolescent and adult waves of the study. Results indicated that CPA and CSA were not significant predictors of cigarette smoking prevalence in adolescence or in adulthood. However, after accounting for childhood SES and gender, CPA and CSA were significantly predictive of the frequency of smoking in adolescence (Betas = .167 and .219, ps < .01, respectively). The frequency of smoking in adolescence was, in turn, predictive of smoking frequency in adulthood (Beta = .492, $p < .001$). Indirect pathways from CSA and CPA to adult smoking through adolescent smoking were statistically significant (not depicted in figure). These findings indicate that participants who experienced CPA or CSA smoked more frequently in adolescence, and this, in turn, increased the frequency of their smoking in adulthood.

Question 2: Does the relationship between childhood abuse and later cigarette smoking differ for males and females?

Gender was removed as a covariate and coefficients along the significant pathways of the model shown in Figure 1 were re-estimated for males and females using a multiple-group approach. The LRT chi-square comparison test showed that the freely estimated model fit the data better than the constrained model in which path coefficients were set to equality for males and females, suggesting that one or more of the paths significantly differed (LRT chi-square =14.11 (2), p<.05). To identify which path or paths of the model did in fact differ, each path was constrained and examined separately.

Consistent with the results from the combined model (shown in Figure 1), CSA was shown to predict adolescent smoking frequency for both males and females (standardized coefficients, Betas=.234 and .207, *ps* <.01, respectively). Path coefficients in this case did not differ statistically. However, coefficients did differ for the path from CPA to adolescent smoking. That is, for males but not females, CPA predicted adolescent smoking frequency (Beta=.203, p<.05). Although it appeared that the path from CPA to adult smoking frequency also differed (Beta=.150, p < .05, Beta=.000, p>.05, males to females respectively), the LRT for these coefficients did not differ statistically. Additionally, for both males and females, adolescent smoking frequency predicted adulthood smoking frequency (Betas = .456 and .544, *p*s < .001, respectively). However, the LRT Chi-square test for the difference in the coefficients showed they differed significantly, indicating that the association is stronger for females than for males.

Differences in the associations between covariates (childhood SES) and outcomes also were found. For females, but not males, childhood SES predicted significantly adolescent smoking frequency (Beta=−.158, *p*=.05), but not adult smoking frequency. However, for males but not females, childhood SES predicted significantly adulthood smoking frequency (Beta=− .119, *p*=.08). Figures 2 and 3 present the final models by gender.

Discussion

This study focused on physical and sexual abuse as predictors of adolescent and adult cigarette smoking behaviors. It also examined the moderating role of gender in the prediction from childhood abuse to later smoking frequency, and the continuity of smoking from adolescence into adulthood. Findings overall show that both childhood physical and sexual abuse are significant predictors of adolescent smoking frequency, but not smoking prevalence in adolescence. Adolescent smoking frequency predicted the frequency of smoking in adulthood. Interestingly gender moderated the effect of child abuse on adolescent smoking frequency, suggesting that pathways leading from childhood abuse to later smoking differ for males and females. Specifically, results suggest that is a predictor of adolescent smoking frequency for males, and adolescent smoking frequency is a stronger predictor of adult smoking frequency for females. While the first model supports the growing body of literature linking child abuse to later smoking behavior, further investigations, particularly of gender differences, are required.

It is notable, if not somewhat surprising, that abuse in childhood appeared not to increase the likelihood of an adolescent's decision to smoke, but only to smoke more frequently. The high rate of reported smoking prevalence in adolescence (~50%) in the study sample, which is approximately five times the national average for children ages 12–17 [6], may have influenced our ability to detect significant effect sizes of child abuse as a risk factor for smoking prevalence. It may also be that what is reflected in the smoking prevalence measure is more normative experimentation (i.e. tried smoking but did not continue) whereas the increased frequency of smoking is more indicative of problematic smoking behavior that would be expected of youth and adults who experienced adverse childhood adversities, like abuse histories [11].

In that physical and sexual abuse of children increases the risk of frequent adolescent smoking, primary prevention efforts focused on reducing smoking risks are required [28]. There are various examples of primary prevention models that hold promise for reducing the risk of childhood abuse, including Nurse Family Partnership (NFP) [29]. Cost-benefit studies suggest that programs like NFP not only benefit potential victims of abuse, but also the general public who shoulder the costs of victims' health and medical care [30].

Goals of Healthy People 2020 include preventing new adolescent smokers and improving the effectiveness of smoking cessation programs for young people [31]. Reducing the frequency of smoking, even if not reaching total abstinence, can bring about health benefits [32], although to what extent remains unclear [33]. Attention should, therefore, focus on helping youth, including those who have been abused, lessen their use of cigarettes and eventually give them up entirely. Successful smoking cessation efforts among trauma patients have been documented [34], although more research on such programs is needed.

Contrary to the findings of Topitzes et al. [13], the current study found some evidence of gender differences in childhood abuse and later smoking. For both females and males, sexual abuse increased the risk of frequent smoking in adolescence. However, the effect of physical abuse was somewhat stronger for males. It has been theorized that abuse of different forms can affect males and females differently, although evidence supporting this hypothesis has been rather scant [35]. Whether or not findings suggest the need for gender-specific prevention programs is an issue requiring further investigation.

Limitations of this study include a reliance on self-reports of smoking, retrospective measurement of sexual abuse, and lack of attention to mediators of abuse in the prediction of smoking outcomes. Additionally, not all possible covariates (i.e. parental smoking) of abuse and smoking were taken into account, which could influence results shown. Nevertheless, this prospective study of two forms of childhood abuse offers a major advance over retrospective studies. At a broad scale, results point to the long-term health risk behaviors that can follow from childhood abuse, which remain into the adult years.

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Implications and Contributions

While childhood physical and sexual abuse are not statistically related to an individual's having initiated smoking, physical and sexual abuse increase the frequency of smoking during adolescence and adulthood. Certain gender differences in pathways from abuse to later smoking frequency were found. Implications for primary and secondary prevention are discussed.

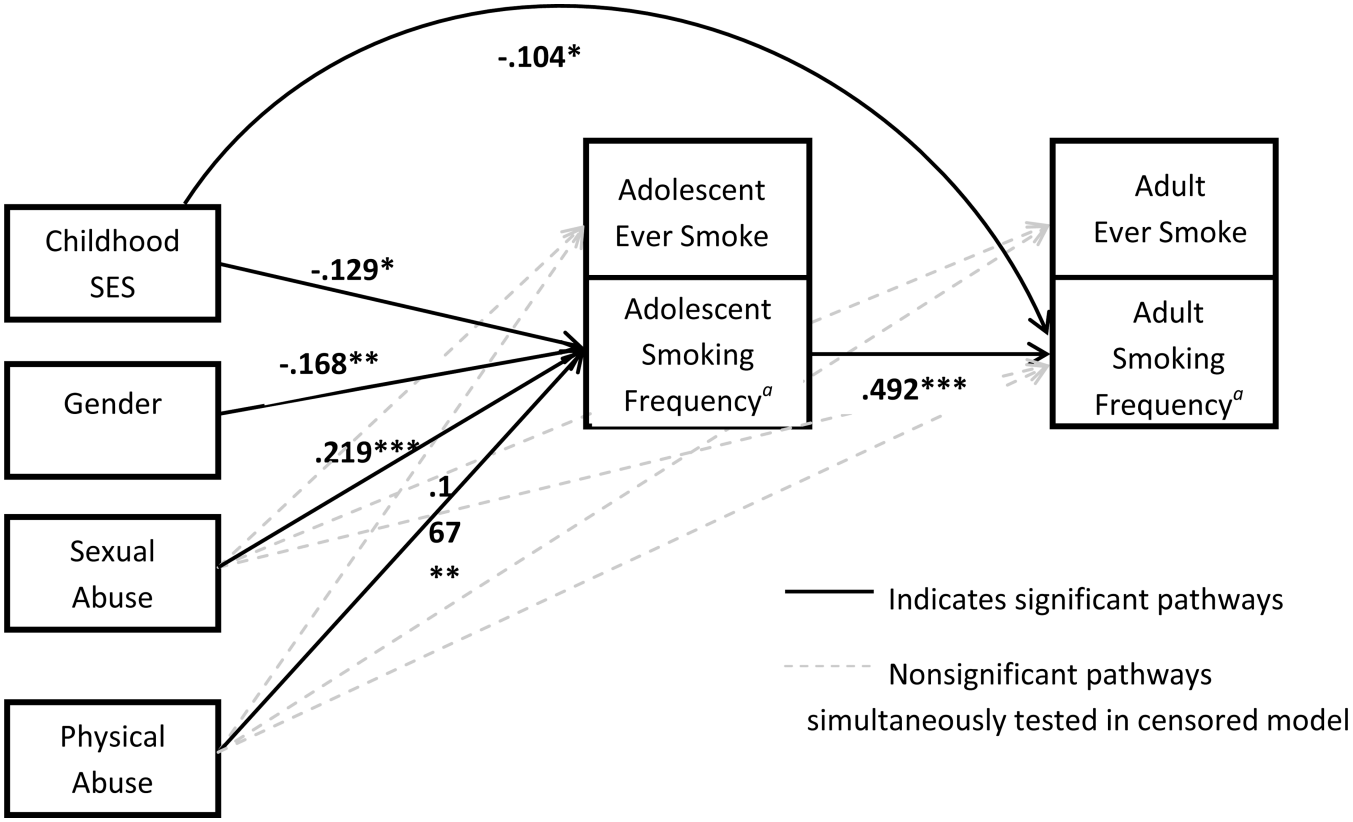

Figure 1.

Standardized coefficients of main effects censored model of childhood abuse and smoking behavior in adolescence and adulthood. Full sample.

a – Smoking frequency is calculated among those people who have ever smoked.

* p < .05, ** p < .01, *** p < .001.

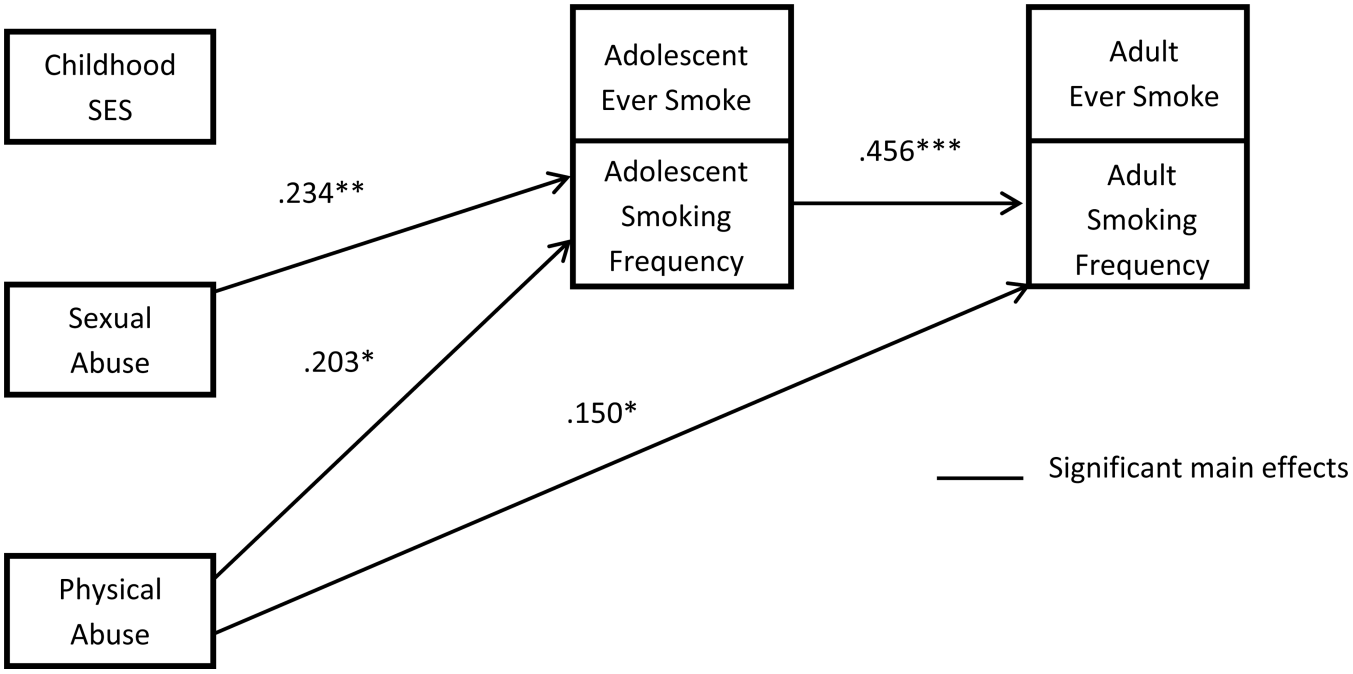

Figure 2.
MALE MODEL. Standardized path coefficients for main effects of childhood abuse on smoking behavior in adolescence and adulthood.
* $p < .05$, ** $p < .01$, *** $p < .001$.

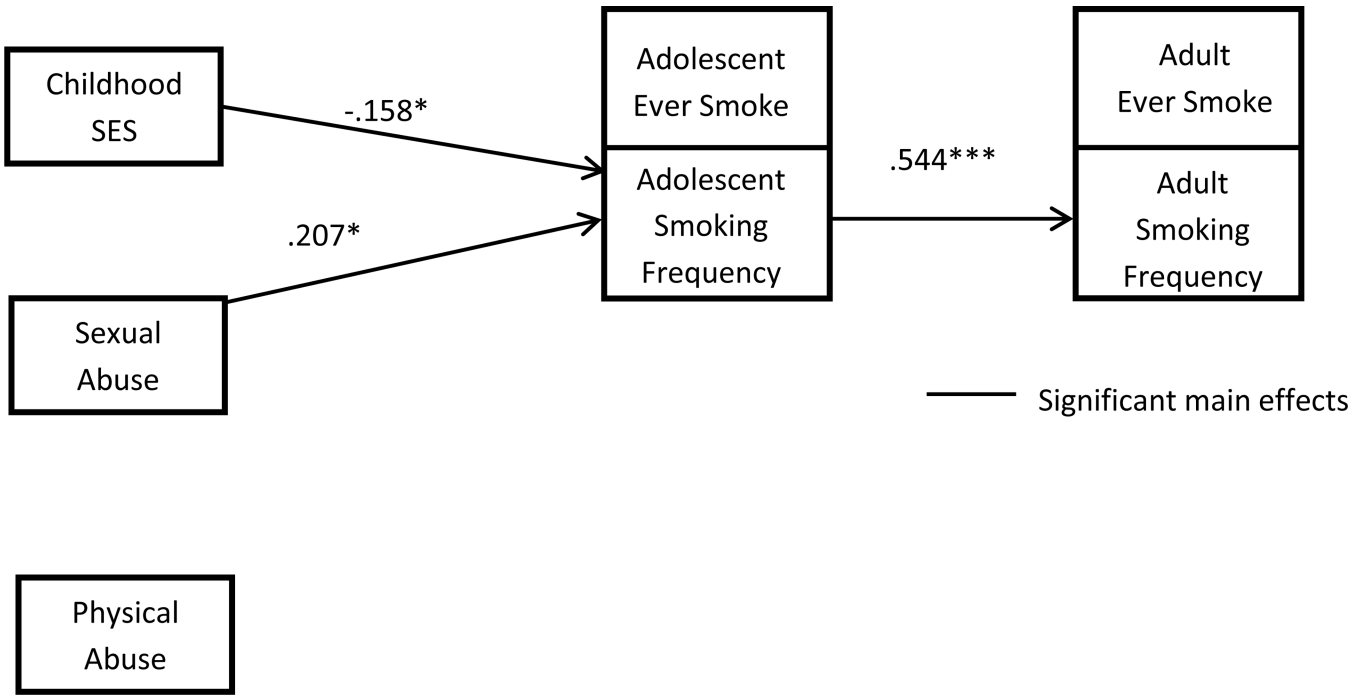

Figure 3.
FEMALE MODEL. Standardized path coefficients for main effects of childhood abuse on smoking behavior in adolescence and adulthood.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1

Child physical and sexual abuse and cigarette smoking behavior in adolescence and adulthood

Correlation table of study variables		**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**
1.	Gender (female)	1							
2.	Childhood Socioeconomic status	.00	1						
3.	Childhood Sexual Abuse	.23**	−.36**	1					
4.	Childhood Physical Abuse	−.03	−.19**	.16*	1				
5.	Adolescent smoking lifetime	−.13*	−.19**	.16*	.18**	1			
6.	Adolescent smoking frequency[a]	−.11	−.25**	.26**	.19*	*b*----	1		
7.	Adult smoking lifetime	.26**	−.14*	.25**	.10	.16	.11	1	
8.	Adult smoking frequency[a]	−.09	−.15	.10	.16	.14	.41**	*b*----	1

Note.

[a] Frequency of smoking is calculated for those who reported having ever smoked.

b correlations cannot be calculated within smokers since one variable is constant.

* p < .05,

** p < .01,

*** p < .001.